

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re Application of:

Toshihiko FUJI et al.

Serial No.: 09/772,001

Filed: January 30, 2001

For: SURFACE TREATMENT AGENT FOR RESIST PATTERN AND PATTERNING
PROCESS

BOX AF

Group Art Unit.: 1756

Examiner: SAGAR, Kripa



AF/1756
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TC 1700

#8 (Appeal)
Brief

BRIEF ON APPEAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Further to the Notice of Appeal filed on April 30, 2003, herewith are three copies of Appellants' Brief on Appeal. The attached check includes the statutory fee for the filing of this Brief and the necessary extension fee.

This is an appeal from the decision of the Examiner finally rejecting claims 1-20 of the above-identified application.

(1) REAL PARTY IN INTEREST

The real party in interest in the present application is Shin-Etsu Chemical Co., Ltd., to whom the present application was assigned on January 12, 2001.

(2) RELATED APPEALS AND INTERFERENCES

There are no known related appeals or interferences.

APPROPRIATE DOCUMENT 09060031 09772001

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(3) STATUS OF THE CLAIMS

Claims 1-20 are pending in the present application. All the pending claims were rejected and are on appeal.

(4) STATUS OF AMENDMENTS AFTER FINAL

Not applicable - no amendments filed after final.

(5) SUMMARY OF THE INVENTION

The invention provides a surface treatment agent (primer) used in a resist patterning process, wherein the surface treatment agent is applied to a substrate prior to the formation of a resist pattern thereon, whereby the adhesion between the substrate and the resist pattern is strengthened. See specification on page 2, lines 8-11.

(6) ISSUES

The issue outstanding in this application are:

(1) a rejection under 35 U.S.C. § 103, i.e., whether claims 1-20 are patentable over Lutz et al., US 5,973,004, in view of Harris et al., US 5,668,210.

(7) GROUPING OF THE CLAIMS

For the purpose of this appeal, claims 4-11 and 20, i.e., the process claims are considered to stand or fall together, and claims 1-3 and 12-19, i.e., the product claims are considered to stand or fall together.

(8) APPELLANTS' ARGUMENTS

Claims 1-20 were rejected as allegedly unpatentable over Lutz et al., US 5,973,004, in view of Harris et al., US 5,668,210.

The final rejection action, paper number 6, maintains the allegation that Lutz teaches the use of silane and siloxane containing compositions as adhesion promoters and “primers.” Applicants respectfully disagree. Lutz does not teach primers. A primers in the present context is “a surface treatment agent which, when applied to a substrate prior to formation of a resist pattern thereon, strengthens adhesion between the substrate and the resist pattern.” See the claim preamble in both product and process claims which is to be given weight in this case. The word and the concept of a primer do not appear anywhere in the reference. Lutz only teaches his compositions as “useful as adhesion-promoting additives for curable organopolysiloxane compositions.” (emphasis added) See column 5, lines 53-54, and column, 7, line 66 to column 8, line 4. Thus, Lutz adds the adhesion promoter to the siloxane component whose adhesion is to be enhanced. The reference never teaches or suggests a surface treatment agent as claimed wherein an adhesion promoter agent is applied to the substrate prior to, rather than simultaneously with, formation of a resist pattern (indeed, the reference never even mentions a resist pattern). The present claims are not directed to an embodiment where the primer is brought into a composition with the material that is to form the resist pattern, i.e., is not directed to an additive.

The claims of the present invention clearly and explicitly teach that the surface treatment agent is applied to the substrate “prior” to formation of a resist pattern thereon. The claimed composition cannot be understood to comprise the components of the resist pattern itself. This is further supported by the surface treatment agent being defined in both product and process claims by the language “consisting essentially of” at least a compound of formula (1) and a solvent. The consisting “essentially of language” clearly excludes the siloxanes that are being adhered. The inclusion of the siloxanes to be adhered in the primer would materially affect the basic and novel properties of invention. See *PPG Industries Inc. v. Guardian Industries Corp.*, 48 USPQ2d 1351 (CAFC 1998). The claimed primer would no longer be a primer if it would include the siloxanes to be adhered. It would become an additive. With respect to the process claims, it is also clear that the steps are to be performed independently and not simultaneously. The primer therein is also defined by the “consisting essentially of” language, which requires that it is applied separately from the siloxanes that

are to be adhered, and the resist pattern is defined to be applied "thereon" after the baking step.

Additionally, paper number 6 alleges that the prior art to Lutz demonstrates that primers are well known in the art of lithography. Applicants carefully reviewed the Lutz reference and do not see any discussion about primers or lithography therein whether in the discussed prior art, nor in the rest of the specification.

Paper number 6 alleges that Lutz teaches a prior art adhesion promoter, CA-4, i.e., 3-glycidoxypolytrimethoxysilane. But CA-4 is taught to be an additive, and not a primer. Lutz states that "[c]urable organopolysiloxane compositions containing the organosilicon compositions OC-1, OC-2, OC-3, and OC-4 at two concentration levels were prepared by making a physical blend of the ingredients," see column 7, line 65 to column 8, line 2, and states that "curable compositions were prepared which ... contained the compounds referred to hereinafter as CA-1 to CA-4," see column 8, lines 5-8. Paper number 6 alleges that CA-4 is similar to the claimed material by the present application as a primer. The Office Action points to the compound in claim 2. The compound of claim 2 however is not claimed as the primer in the present invention. The compound of claim 2 is used for the preparation of the compound of formula 1, which is used as the primer. Thus, CA-4 is not similar to the compound claimed to be the primer. The compound of claim 2 is hydrolyzed prior to its use as an adhesion promoter in order to achieve the primer of claim 1.

The reference provides an example 6, as alleged, which states that improvement in adhesion to glass and epoxy resin was achieved by the addition of CA-4 to ethylene glycol and a hydroxyl-terminated methylvinylsiloxane. See column 9, line 62 to column 10, line 10. The reference also provides data in the same example for bare aluminum, mill aluminum, and copper. See table 3. No mention of improvement in adhesion with respect to those materials is noted, while aluminum and copper are claimed substrates in the present invention. See claims 6 and 17. Thus, the data for an improvement in adhesion with CA-4 in combination with ethylene glycol and a hydroxyl-terminated methylvinylsiloxane varies depending the substrate used. Additionally, CA-4 was not used as a primer in said example. Instead it was used as an additive. Furthermore, no teaching or suggestion is provided by the reference for the formation of a resist pattern after the use of CA-4 in combination with ethylene glycol and a hydroxyl-terminated methylvinylsiloxane.

Additionally, Lutz is not relevant, i.e., analogous, art to the present invention which involves primers for use in and in a process of forming a resist pattern. In *In re Clay*, 966

F.2d 656, 23 USPQ.2d 1058 (CAFC 1992) the court stated that a prerequisite of an obviousness determination is to define the art to which the subject matter sought to be patented pertains, i.e., whether it is analogous art, i.e., whether the art is too remote to be treated as prior art which would be consulted by a skilled worker.

The two criteria identified were whether the art is from the same field of endeavor, or whether the reference, if not in the same field of endeavor, still is reasonably pertinent to the particular problem with which the inventor is involved. The court in *Clay* held that the two prior art references could not be considered to be in the same field of endeavor merely because they relate to the petroleum industry. Similarly here, the reference cannot be said to be in the same field of endeavor as the present invention merely because when broadly defined they may belong to a similar industry.

In *Clay*, the court specifically looked at the differing environments the two inventions were to operate in. The field of resists is a very specialized and unique area of art requiring clean environments and special conditions. One of ordinary skill in the art would only be motivated to look at references discussing resists when considering solving a problem in this art. Lutz does not teach resists. Lutz nowhere mentions the formation of a resist pattern. Even paper number 6 admitted that Lutz does not teach the patterning of a resist. The reference only teaches that “[g]ood adhesion of curable organopolysiloxane compositions is desirable for a variety of end use applications, particularly in electronics, construction, packaging, automotive and consumer markets.” Accordingly, a person of ordinary skill in the art would not reasonably have expected to solve a problem relating to adhesion of resist patterns by considering the Lutz reference. Additionally, even the temperatures used for curing are different in Lutz than in the present claims. The Lutz compositions, including ones using CA-4 as an ingredient were cured either at room temperature or for 30 minutes at 70°C in a forced air oven followed by additional curing time at room temperature, see column 8, lines 45-50, whereas the primers of the present invention cure at 80 to 120°C, see independent process claim 4, specification page 4, lines 19-21, and examples in the specification.

Whether the reference is reasonably pertinent to the particular problem with which the inventor is involved also requires a look at the purpose of the prior art invention. If the reference is directed to a different purpose than the current invention, the inventor would accordingly have had less motivation or occasion to consider it. Lutz’s invention is directed to additives to promote adhesion of curable organopolysiloxanes generally (see discussion

above about broad classes of uses in Lutz) while the present invention is directed to a primer that promotes the adhesion of a resist composition. These purposes are too remote to provide the motivation to a skilled worker to consult Lutz when trying to solve a problem related to resists.

Harris, the secondary reference, teaches silicone containing hydrolyzed or partially hydrolyzed compounds (these compounds are not alleged to be similar to the presently claimed primers) useful as coating compositions for a variety of end uses, such as coatings for multichip modules, flat panel displays and integrated circuits. See abstract. These coatings can be used as adhesion promoters when used as a primer to adhere polymeric materials or acrylcyclobutene resins. See column 1, line 19-35. Nowhere does this reference as well teach or suggest the end product/use of the present invention, i.e., a resist pattern.

Paper number 6 alleges that it would have been obvious to use Lutz's organo-silane primer to increase the adhesion of photoresists to substrates as taught by Harris because it teaches that it is conventional in the art. However, Lutz's organo-silane primer as discussed above is not used as a primer, but an additive, to a curable organosilicon-composition. See column 5, lines 53-54, and column, 7, line 66 to column 8, line 4. Thus, even if Harris teaches the use of primers generally, the combination of this disclosure with that of Lutz would not render the claimed invention obvious. No teaching or motivation is present in the references, which would motivate one of ordinary skill in the art to use the additive taught by Lutz as a primer. Even if it were known that one could use Lutz's additive-only ingredient as a primer, that would be insufficient. The law requires a showing that one should do so, i.e., proof of motivation to do so.

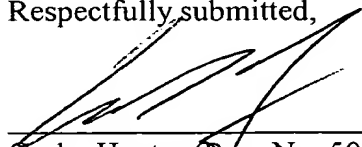
Paper number 6 also alleges that based on the examples in Harris one would have a reasonable expectation of improving adhesion by using partially hydrolyzed silanes. Even if admitted, which it is not, this disclosure would not render the claimed invention obvious. The silanes of Harris and the examples therein, are directed to uses of the silanes that are not alleged to be similar to the claimed primers and no resist pattern is taught or suggested thereon.

While a process of forming a resist pattern may be known, in an obviousness rejection using several references, the motivation must come from teachings and/or suggestions in the references themselves. Neither reference used in the rejections involves a process wherein a resist pattern is formed. No teaching or suggestion is present in the references to select CA-4 of the primary reference used only as an additive. The data on CA-4 when combined with

ethylene glycol and a hydroxyl-terminated methylvinylsiloxane showed an improvement in adhesion to glass and epoxy resin but no mention of improvement is made with respect to adhesion to bare aluminum, mill aluminum, and copper, that were also tested (see discussion above), while aluminum and copper are claimed substrates in the present invention. Thus, one of ordinary skill in the art would have lacked the motivation to combine the references in a way which would lead to the presently claimed invention.

Reversal of the rejections is respectfully and courteously requested.

Respectfully submitted,



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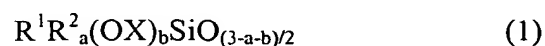
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Date: June 30, 2003

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APPENDIX

1. (Amended) A surface treatment agent which, when applied to a substrate prior to formation of a resist pattern thereon, strengthens adhesion between the substrate and the resist pattern, the surface treatment agent consisting essentially of at least one compound of the following compositional formula:



wherein R^1 is a $-(CH_2)_nY$ moiety in which Y is epoxycyclohexyl, glycidoxy, N- β -aminoethylamino, amino, N-phenylamino, mercapto or isocyanate, and n is an integer from 0 to 4; R^2 is a monovalent hydrocarbon group of 1 to 4 carbons; X is hydrogen or a monovalent hydrocarbon group of 1 to 4 carbons; "a" is 0 or 1, and "b" is 0, 1 or 2 when "a" is 0, and "b" is 0 or 1 when "a" is 1, and a solvent selected from the group consisting of alcohols, aromatic solvents, esters and ketones, the concentration of said compound of formula (1) in said surface treatment agent being in the range of 0.001 to 5% by weight.

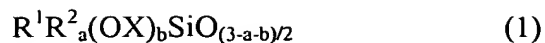
2. The surface treatment agent of claim 1, wherein the compound of compositional formula (1) is prepared by hydrolyzing a silane of general formula (2):



wherein R^1 , R^2 and "a" are as defined above; Z is a monovalent hydrocarbon group of 1 to 4 carbons; and "c" is a number which satisfies the condition $a+c = 3$.

3. The surface treatment agent of claim 1, wherein R^1 is selected from the group consisting of β -(3,4-epoxycyclohexyl)ethyl, γ -aminopropyl, γ -mercaptopropyl, γ -isocyanatepropyl, N- β -(aminoethyl)- γ -aminopropyl, γ -glycidoxypropyl and N-phenyl- γ -aminopropyl.

4. (Amended) A patterning process for forming a resist pattern on a substrate comprising the steps of applying to the substrate a surface treatment agent consisting essentially of at least one compound of the following compositional formula:



wherein R^1 is a $-(CH_2)_nY$ moiety in which Y is epoxycyclohexyl, glycidoxy, N- β -aminoethylamino, amino, N-phenylamino, mercapto or isocyanate, and n is an integer from 0 to 4; R^2 is a monovalent hydrocarbon group of 1 to 4 carbons; X is hydrogen or a monovalent hydrocarbon group of 1 to 4 carbons; "a" is 0 or 1, and "b" is 0, 1 or 2 when "a" is 0, and "b" is 0 or 1 when "a" is 1, and a solvent selected from the group consisting of alcohols, aromatic solvents, esters and ketones, the concentration of said compound of formula (1) being in the range of 0.001 to 5% by weight,

baking at 80 to 120°C, and

applying thereon a photoresist composition and patterning the photoresist composition.

5. The patterning process of claim 4, wherein the substrate is a metal or metal oxide substrate.

6. The patterning process of claim 5, wherein the metal or metal oxide making up the substrate is aluminum, iron, nickel, copper, tantalum, gold, or an oxide thereof.

7. The patterning process of claim 4, wherein the compound of formula (1) is applied onto the substrate to a thickness of up to 0.1 μm .

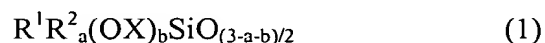
8. The patterning process of claim 4, wherein R^2 is methyl, ethyl, propyl, butyl, or alkenyl.

9. The patterning process of claim 4, wherein R^2 is vinyl or propyl.

10. The patterning process of claim 4, wherein Y is epoxycyclohexyl, N- β -aminoethylamino, amino, N-phenylamino, mercapto or isocyanate.

11. The patterning process of claim 4, wherein the compound of formula (1) comprises up to 200 silicon atoms.

12. A surface treatment agent according to claim 1, wherein R² is methyl, ethyl, propyl, butyl, or alkenyl.
13. A surface treatment agent according to claim 1, wherein R² is vinyl or propyl.
14. A surface treatment agent according to claim 1, wherein Y is epoxycyclohexyl, N-β-aminoethylamino, amino, N-phenylamino, mercapto or isocyanate.
15. A surface treatment agent according to claim 1, wherein the compound of formula (1) comprises up to 200 silicon atoms.
16. A surface treatment agent according to claim 1 on a substrate which is a metal or metal oxide substrate.
17. A surface treatment agent according to claim 1 on a substrate which is aluminum, iron, nickel, copper, tantalum, gold, or an oxide thereof.
18. A surface treatment agent according to claim 1 on a substrate which is up to 0.1 μm thick.
19. A surface treatment agent which, when applied to a substrate prior to formation of a resist pattern thereon, strengthens adhesion between the substrate and the resist pattern, the surface treatment agent comprising at least one compound of the following compositional formula:



wherein R¹ is a -(CH₂)_nY moiety in which Y is epoxycyclohexyl, glycidoxo, N-β-aminoethylamino, amino, N-phenylamino, mercapto or isocyanate, and n is an integer from 0 to 4; R² is a monovalent hydrocarbon group of 1 to 4 carbons; X is hydrogen or a monovalent hydrocarbon group of 1 to 4 carbons; "a" is 0 or 1, and "b" is 0, 1 or 2 when "a" is 0, and "b" is 0 or 1 when "a" is 1.

20. A patterning process comprising the steps of applying the surface treatment agent of claim 19 to a substrate and baking, then applying thereon a photoresist composition and patterning the photoresist.